STAAR
STANDARDS

STAAR STANDARDS

BIOLOGY

Process Standards (Scientific Investigation and Reasoning Skills)	
B.1	**Scientific processes.** The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices.
B.2	**Scientific processes.** The student uses scientific methods and equipment during laboratory and field investigations.
B.3	**Scientific processes.** The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom.

STAAR	Tools to Know		Ways to Show	
≥ 40% of items will be dual coded	B.1(A)	demonstrate safe practices during laboratory and field investigations	B.2(G)	analyze, evaluate, make inferences, and predict trends from data
	B.1(B)	demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials	B.2(H)	communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports
	B.2(A)	know the definition of science and understand that it has limitations, as specified in chapter 112.34, subsection (b)(2) of 19 TAC	B.3(A)	in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student
	B.2(B)	know that hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories	B.3(B)	communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials
	B.2(C)	know scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly-reliable explanations, but they may be subject to change as new areas of science and new technologies are developed;	B.3(C)	draw inferences based on data related to promotional materials for products and services
	B.2(D)	distinguish between scientific hypotheses and scientific theories	B.3(D)	evaluate the impact of scientific research on society and the environment
	B.2(E)	plan and implement descriptive, comparative, and experimental investigations, including asking questions, formulating testable hypotheses, and selecting equipment and technology	B.3(E)	evaluate models according to their limitations in representing biological objects or events
	B.2(F)	collect and organize qualitative and quantitative data and make measurements with accuracy and precision using tools such as calculators, spreadsheet software, data-collecting probes, computers, standard laboratory glassware, microscopes, various prepared slides, stereoscopes, metric rulers, electronic balances, gel electrophoresis apparatuses, micropipettors, hand lenses, Celsius thermometers, hot plates, lab notebooks or journals, timing devices, cameras, Petri dishes, lab incubators, dissection equipment, meter sticks, and models, diagrams, or samples of biological specimens or structures	B.3(F)	research and describe the history of biology and contributions of scientists

Knowledge and Skills Statements	
B.4	**Science concepts.** The student knows that cells are the basic structures of all living things with specialized parts that perform specific functions and that viruses are different from cells.
B.5	**Science concepts.** The student knows how an organism grows and the importance of cell differentiation.
B.6	**Science concepts.** The student knows the mechanisms of genetics, including the role of nucleic acids and the principles of Mendelian Genetics.
B.7	**Science concepts.** The student knows evolutionary theory is a scientific explanation for the unity and diversity of life.
B.8	**Science concepts.** The student knows that taxonomy is a branching classification based on the shared characteristics of organisms and can change as new discoveries are made.
B.9	**Science concepts.** The student knows the significance of various molecules involved in metabolic processes and energy conversions that occur in living organisms.
B.10	**Science concepts.** The student knows that biological systems are composed of multiple levels.
B.11	**Science concepts.** The student knows that biological systems work to achieve and maintain balance.
B.12	**Science concepts.** The student knows that interdependence and interactions occur within an environmental system.

Rptg Cat	STAAR	Readiness Standards	Supporting Standards
1 Cell Structure and Function	11	B.4(B) investigate and explain cellular processes, including homeostasis, energy conversions, transport of molecules, and synthesis of new molecules B.4(C) compare the structures of viruses to cells, describe viral reproduction, and describe the role of viruses in causing diseases such as human immunodeficiency virus (HIV) and influenza B.5(A) describe the stages of the cell cycle, including deoxyribonucleic acid (DNA) replication and mitosis, and the importance of the cell cycle to the growth of organisms B.9(A) compare the structures and functions of different types of biomolecules, including carbohydrates, lipids, proteins, and nucleic acids	B.4(A) compare and contrast prokaryotic and eukaryotic cells B.5(B) examine specialized cells, including roots, stems, and leaves of plants; and animal cells such as blood, muscle, and epithelium B.5(C) describe the roles of DNA, ribonucleic acid (RNA), and environmental factors in cell differentiation B.5(D) recognize that disruptions of the cell cycle lead to diseases such as cancer B.9(D) analyze and evaluate the evidence regarding formation of simple organic molecules and their organization into long complex molecules having information such as the DNA molecule for self-replicating life
2 Mechanisms of Genetics	11	B.6(A) identify components of DNA, and describe how information for specifying the traits of an organism is carried in the DNA B.6(E) identify and illustrate changes in DNA and evaluate the significance of these changes B.6(F) predict possible outcomes of various genetic combinations such as monohybrid crosses, dihybrid crosses and non-Mendelian inheritance	B.6(B) recognize that components that make up the genetic code are common to all organisms B.6(C) explain the purpose and process of transcription and translation using models of DNA and RNA B.6(D) recognize that gene expression is a regulated process B.6(G) recognize the significance of meiosis to sexual reproduction B.6(H) describe how techniques such as DNA fingerprinting, genetic modifications, and chromosomal analysis are used to study the genomes of organisms
3 Biological Evolution and Classification	10	B.7(A) analyze and evaluate how evidence of common ancestry among groups is provided by the fossil record, biogeography, and homologies, including anatomical, molecular, and developmental B.7(E) analyze and evaluate the relationship of natural selection to adaptation and to the development of diversity in and among species B.8(B) categorize organisms using a hierarchical classification system based on similarities and differences shared among groups	B.7(B) analyze and evaluate scientific explanations concerning any data of sudden appearance, stasis, and sequential nature of groups in the fossil record B.7(C) analyze and evaluate how natural selection produces change in populations, not individuals B.7(D) analyze and evaluate how the elements of natural selection, including inherited variation, the potential of a population to produce more offspring than can survive, and a finite supply of environmental resources, result in differential reproductive success B.7(F) analyze and evaluate the effects of other evolutionary mechanisms, including genetic drift, gene flow, mutation, and recombination B.7(G) analyze and evaluate scientific explanations concerning the complexity of the cell B.8(A) define taxonomy and recognize the importance of a standardized taxonomic system to the scientific community B.8(C) compare characteristics of taxonomic groups, including archaea, bacteria, protists, fungi, plants, and animals
4 Biological Processes and Systems	11	B.10(A) describe the interactions that occur among systems that perform the functions of regulation, nutrient absorption, reproduction, and defense from injury or illness in animals B.10(B) describe the interactions that occur among systems that perform the functions of transport, reproduction, and response in plants	B.9(B) compare the reactants and products of photosynthesis and cellular respiration in terms of energy and matter B.9(C) identify and investigate the role of enzymes B.10(C) analyze the levels of organization in biological systems and relate the levels to each other and to the whole system B.11(A) describe the role of internal feedback mechanisms in the maintenance of homeostasis
5 Interdependence within Environmental Systems	11	B.11(D) describe how events and processes that occur during ecological succession can change populations and species diversity B.12(A) interpret relationships, including predation, parasitism, commensalism, mutualism, and competition among organisms B.12(C) analyze the flow of matter and energy through trophic levels using various models, including food chains, food webs, and ecological pyramids B.12(F) describe how environmental change can impact ecosystem stability	B.11(B) investigate and analyze how organisms, populations, and communities respond to external factors B.11(C) summarize the role of microorganisms in both maintaining and disrupting the health of both organisms and ecosystems B.12(B) compare variations and adaptations of organisms in different ecosystems B.12(D) recognize that long-term survival of species is dependent on changing resource bases that are limited B.12(E) describe the flow of matter through the carbon and nitrogen cycles and explain the consequences of disrupting these cycles
# Items	54	32-25 questions from Readiness Standards	19-22 questions from Supporting Standards

STAAR
STANDARDS
CHEMISTRY

Process Standards (Scientific Investigation and Reasoning Skills)

C.1	**Scientific processes.** The student, for at least 40% of instructional time, conducts laboratory and field investigations using safe, environmentally appropriate, and ethical practices.
C.2	**Scientific processes.** The student uses scientific methods to solve investigative questions.
C.3	**Scientific processes.** The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom.

Tools to Know

C.1(A)	demonstrate safe practices during laboratory and field investigations, including the appropriate use of safety showers, eyewash fountains, safety goggles, and fire extinguishers
C.1(B)	know specific hazards of chemical substances such as flammability, corrosiveness, and radioactivity as summarized on the Material Safety Data Sheets (MSDS)
C.1(C)	demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials
C.2(A)	know the definition of science and understand that it has limitations, as specified in chapter 112.35, subsection (b)(2) of 19 TAC
C.2(B)	know that scientific hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories
C.2(C)	know that scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly-reliable explanations, but may be subject to change as new areas of science and new technologies are developed;
C.2(D)	distinguish between scientific hypotheses and scientific theories
C.2(E)	plan and implement investigative procedures, including asking questions, formulating testable hypotheses, and selecting equipment and technology, including graphing calculators, computers and probes, sufficient scientific glassware such as beakers, Erlenmeyer flasks, pipettes, graduated cylinders, volumetric flasks, safety goggles, and burettes, electronic balances, and an adequate supply of consumable chemicals
C.2(F)	collect data and make measurements with accuracy and precision
C.2(G)	express and manipulate chemical quantities using scientific conventions and mathematical procedures, including dimensional analysis, scientific notation, and significant figures

Ways to Show

C.2(H)	organize, analyze, evaluate, make inferences, and predict trends from data
C.2(I)	communicate valid conclusions supported by the data through methods such as lab reports, labeled drawings, graphs, journals, summaries, oral reports, and technology-based reports
C.3(A)	in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student
C.3(B)	communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials
C.3(C)	draw inferences based on data related to promotional materials for products and services
C.3(D)	evaluate the impact of research on scientific thought, society, and the environment
C.3(E)	describe the connection between chemistry and future careers
C.3(F)	research and describe the history of chemistry and contributions of scientists

Knowledge and Skills Statements

C.4	**Science concepts.** The student knows the characteristics of matter and can analyze the relationships between chemical and physical changes and properties.
C.5	**Science concepts.** The student understands the historical development of the Periodic Table and can apply its predictive power.
C.6	**Science concepts.** The student knows and understands the historical development of atomic theory.
C.7	**Science concepts.** The student knows how atoms form ionic, metallic, and covalent bonds.
C.8	**Science concepts.** The student can quantify the changes that occur during chemical reactions.
C.9	**Science concepts.** The student understands the principles of ideal gas behavior, kinetic molecular theory, and the conditions that influence the behavior of gases.
C.10	**Science concepts.** The student understands and can apply the factors that influence the behavior of solutions.
C.11	**Science concepts.** The student understands the energy changes that occur in chemical reactions.
C.12	**Science concepts.** The student understands the basic processes of nuclear chemistry.

Rptg Cat	Readiness Standards	Supporting Standards
1 Matter and the Periodic Table	C.4(A) differentiate between physical and chemical changes and properties C.4(D) classify matter as pure substances or mixtures through investigation of their properties C.5(B) use the Periodic Table to identify and explain the properties of chemical families, including alkali metals, alkaline earth metals, halogens, noble gases, and transition metals C.5(C) use the Periodic Table to identify and explain periodic trends, including atomic and ionic radii, electronegativity, and ionization energy	C.4(B) identify extensive and intensive properties C.4(C) compare solids, liquids, and gases in terms of compressibility, structure, shape, and volume C.5(A) explain the use of chemical and physical properties in the historical development of the Periodic Table
2 Atomic Structure and Nuclear Chemistry	C.6(E) express the arrangement of electrons in atoms through electron configurations and Lewis valence electron dot structures C.12(B) describe radioactive decay process in terms of balanced nuclear equations	C.6(A) understand the experimental design and conclusions used in the development of modern atomic theory, including Dalton's Postulates, Thomson's discovery of electron properties, Rutherford's nuclear atom, and Bohr's nuclear atom C.6.(B) understand the electromagnetic spectrum and the mathematical relationships between energy, frequency, and wavelength of light C.6(C) calculate the wavelength, frequency, and energy of light using Planck's constant and the speed of light C.6(D) use isotopic composition to calculate average atomic mass of an element C.12(A) describe the characteristics of alpha, beta, and gamma radiation C.12(C) compare fission and fusion reactions
3 Bonding and Chemical Reactions	C.7(A) name ionic compounds containing main group or transition metals, covalent compounds, acids, and bases, using International Union of Pure and Applied Chemistry (IUPAC) nomenclature rules C.7(B) write the chemical formulas of common polyatomic ions, ionic compounds containing main group or transition metals, covalent compounds, acids C.7(C) construct electron dot formulas to illustrate ionic and covalent bonds C.8(B) use the mole concept to calculate the number of atoms, ions, or molecules in a sample of material C.8(D) use the law of conservation of mass to write and balance chemical equations	C.7(D) describe the nature of metallic bonding and apply the theory to explain metallic properties such as thermal and electrical conductivity, malleability, and ductility C.7(E) predict molecular structure for molecules with linear, trigonal planar, or tetrahedral electron pair geometries using Valence Shell Electron Pair Repulsion (VSEPR) theory C.8(A) define and use the concept of a mole C.8(C) calculate percent composition and empirical and molecular formulas C.8(E) perform stoichiometric calculations, including determination of mass relationships between reactants and products, calculation of limiting reagents, and percent yield
4 Gases and Thermochemistry	C.9(A) describe and calculate the relations between volume, pressure, number of moles, and temperature for an ideal gas as described by Boyle's law, Charles' law, Avogadro's law, Dalton's law of partial pressure, and the ideal gas law C.11(C) use thermochemical equations to calculate energy changes that occur in chemical reactions and classify reactions as exothermic or endothermic	C.9(B) perform stoichiometric calculations, including determination of mass and volume relationships between reactants and products for reactions involving gases C.9(C) describe the postulates of kinetic molecular theory C.11(A) understand energy and its forms, including kinetic, potential, chemical, and thermal energies C.11(B) understand the law of conservation of energy and the processes of heat transfer C.11(D) perform calculations involving heat, mass, temperature change, and specific heat C.11(E) use calorimetry to calculate the heat of a chemical process
5 Solutions	C.10(B) develop and use general rules regarding solubility through investigations with aqueous solutions C.10(E) distinguish between types of solutions such as electrolytes and nonelectrolytes and unsaturated, saturated, and supersaturated solutions C.10(F) investigate factors that influence solubilities and rates of dissolution such as temperature, agitation, and surface area C.10(H) understand and differentiate among acid-base reactions, precipitation reactions, and oxidation-reduction reactions	C.10(A) describe the unique role of water in chemical and biological systems C.10(C) calculate the concentration of solutions in units of molarity C.10(D) use molarity to calculate the dilutions of solutions C.10(G) define acids and bases and distinguish between Arrhenius and Bronsted-Lowry definitions and predict products in acid-base reactions that form water C.10(I) define pH and use the hydrogen or hydroxide ion concentrations to calculate the pH of a solution C.10(J) distinguish between degrees of dissociation for strong and weak acids and bases

STAAR STANDARDS

PHYSICS

Process Standards (Scientific Investigation and Reasoning Skills)	
P.1	**Scientific processes.** The student conducts investigations, for at least 40% of instructional time, using safe, environmentally appropriate, and ethical practices. These investigations must involve actively obtaining and analyzing data with physical equipment, but may also involve experimentation in a simulated environment as well as field observations that extend beyond the classroom.
P.2	**Scientific processes.** The student uses a systematic approach to answer scientific laboratory and field investigative questions.
P.3	**Scientific processes.** The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom.

Tools to Know	
P.1(A)	demonstrate safe practices during laboratory and field investigations
P.1(B)	demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials
P.2(A)	know the definition of science and understand that it has limitations, as specified in chapter 112.39, subsection (b)(2) of 19 TAC
P.2(B)	know that scientific hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories
P.2(C)	know that scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly-reliable explanations, but may be subject to change as new areas of science and new technologies are developed
P.2(D)	distinguish between scientific hypotheses and scientific theories
P.2(E)	design and implement investigative procedures, including making observations, asking well-defined questions, formulating testable hypotheses, identifying variables, selecting appropriate equipment and technology, and evaluating numerical answers for reasonableness
P.2(F)	demonstrate the use of course apparatus, equipment, techniques, and procedures, including multimeters (current, voltage, resistance), triple beam balances, batteries, clamps, dynamics demonstration equipment, collision apparatus, data acquisition probes, discharge tubes with power supply (H, He, Ne, Ar), hand-held visual spectroscopes, hot plates, slotted and hooked lab masses, bar magnets, horseshoe magnets, plane mirrors, convex lenses, pendulum support, power supply, ring clamps, ring stands, stopwatches, trajectory apparatus, tuning forks, carbon paper, graph paper, magnetic compasses, polarized film, prisms, protractors, resistors, friction blocks, mini lamps (bulbs) and sockets, electrostatics kits, 90-degree rod clamps, metric rulers, spring scales, knife blade switches, Celsius thermometers, meter sticks, scientific calculators, graphing technology, computers, cathode ray tubes with horseshoe magnets, ballistic carts or equivalent, resonance tubes, spools of nylon thread or string, containers of iron filings, rolls of white craft paper, copper wire, Periodic Table, electromagnetic spectrum charts, slinky springs, wave motion ropes, and laser pointers
P.2(G)	use a wide variety of additional course apparatus, equipment, techniques, materials, and procedures as appropriate such as ripple tank with wave generator, wave motion rope, micrometer, caliper, radiation monitor, computer, ballistic pendulum, electroscope, inclined plane, optics bench, optics kit, pulley with table clamp, resonance tube, ring stand screen, four-inch ring, stroboscope, graduated cylinders, and ticker timer
P.2(H)	make measurements with accuracy and precision and record data using scientific notation and International System (SI) units
P.2(I)	identify and quantify causes and effects of uncertainties in measured data

Ways to Show	
P.2(J)	organize and evaluate data and make inferences from data, including the use of tables, charts, and graphs
P.2(K)	communicate valid conclusions supported by the data through various methods such as lab reports, labeled drawings, graphic organizers, journals, summaries, oral reports, and technology-based reports
P.2(L)	express and manipulate relationships among physical variables quantitatively, including the use of graphs, charts, and equations
P.3(A)	in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student
P.3(B)	communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials
P.3(C)	draw inferences based on data related to promotional materials for products and services
P.3(D)	explain the impacts of the scientific contributions of a variety of historical and contemporary scientists on scientific thought and society
P.3(E)	research and describe the connections between physics and future careers
P.3(F)	express and interpret relationships symbolically in accordance with accepted theories to make predictions and solve problems mathematically, including problems requiring proportional reasoning and graphical vector addition

Knowledge and Skills Statements	
P.4	**Science concepts.** The student knows and applies the laws governing motion in a variety of situations.
P.5	**Science concepts.** The student knows the nature of forces in the physical world.
P.6	**Science concepts.** The student knows that changes occur within a physical system and applies the laws of conservation of energy and momentum.
P.7	**Science concepts.** The student knows the characteristics and behavior of waves.
P.8	**Science concepts.** The student knows simple examples of atomic, nuclear, and quantum phenomena.

Rptg Cat	Readiness Standards		Supporting Standards	
1 Force and Motion	P.4(A)	generate and interpret graphs and charts describing different types of motion, including the use of real-time technology such as motion detectors or photogates	P.4(C)	analyze and describe accelerated motion in two dimensions using equations, including projectile and circular examples
	P.4(B)	describe and analyze motion in one dimension using equations with the concepts of distance, displacement, speed, average velocity, instantaneous velocity, and acceleration	P.4(E)	develop and interpret free-body force diagrams
	P.4(D)	calculate the effect of forces on objects, including the law of inertia, the relationship between force and acceleration, and the nature of force pairs between objects	P.4(F)	identify and describe motion relative to different frames of reference
2 Gravitational, Electrical, Magnetic, and Nuclear Forces	P.5(B)	describe and calculate how the magnitude of the gravitational force between two objects depends on their masses and the distance between their centers	P.5(A)	research and describe the historical development of the concepts of gravitational, electromagnetic, weak nuclear, and strong nuclear forces
	P.5(F)	design, construct, and calculate in terms of current through, potential difference across, resistance of, and power used by electric circuit elements connected in both series and parallel combinations	P.5(C)	describe and calculate how the magnitude of the electrical force between two objects depends on their charges and the distance between them
			P.5(D)	identify examples of electric and magnetic forces in everyday life
			P.5(E)	characterize materials as conductors or insulators based on their electrical properties
			P.5(G)	investigate and describe the relationship between electric and magnetic fields in applications such as generators, motors, and transformers
			P.5(H)	describe evidence for and effects of the strong and weak nuclear forces in nature
3 Momentum and Energy	P.6(A)	investigate and calculate quantities using the work-energy theorem in various situations	P.6(E)	describe how the macroscopic properties of a thermodynamic system such as temperature, specific heat, and pressure are related to the molecular level of matter, including kinetic or potential energy of atoms
	P.6(B)	investigate examples of kinetic and potential energy and their transformations	P.6(F)	contrast and give examples of different processes of thermal energy transfer, including conduction, convection, and radiation
	P.6(C)	calculate the mechanical energy of, power generated within, impulse applied to, and momentum of a physical system	P.6(G)	analyze and explain everyday examples that illustrate the laws of thermodynamics, including the law of conservation of energy and the law of entropy
	P.6(D)	demonstrate and apply the laws of conservation of energy and conservation of momentum in one dimension		
4 Waves and Quantum Phenomena	P.7(B)	investigate and analyze characteristics of waves, including velocity, frequency, amplitude, and wavelength, and calculate using the relationship between wavespeed, frequency, and wavelength	P.7(A)	examine and describe oscillatory motion and wave propagation in various types of media
	P.7(D)	investigate behaviors of waves, including reflection, refraction, diffraction, interference, resonance, and the Doppler effect	P.7(C)	compare characteristics and behaviors of transverse waves, including electromagnetic waves and the electromagnetic spectrum, and characteristics and behaviors of longitudinal waves, including sound waves
	P.8(A)	describe the photoelectric effect and the dual nature of light	P.7(E)	describe and predict image formation as a consequence of reflection from a plane mirror and refraction through a thin convex lens
			P.7(F)	describe the role of wave characteristics and behaviors in medical and industrial applications
			P.8(B)	compare and explain the emission spectra produced by various atoms
			P.8(C)	describe the significance of mass-energy equivalence and apply it in explanations of phenomena such as nuclear stability, fission, and fusion
			P.8(D)	give examples of applications of atomic and nuclear phenomena such as radiation therapy, diagnostic imaging, and nuclear power and examples of applications of quantum phenomena such as digital cameras